DOCUMENT RESUME

ED 159 416 CE 017 806

AUTHOR Kromhout, Ora M.
TITLE Florida's Vocational Curriculum System: Needs Assessment and Prioritization.
PUB DATE Mar 78
NOTE 31p.; Pages 22 and 25 will not reproduce well because of poor print quality; Paper presented at the Annual Meeting of the American Educational Research Association (Toronto, Canada, March 27-31, 1978)
AVAILABLE FROM Florida State University, Attn: Ora Kromhout, Career Education Center, 415 North Monroe Street, Tallahassee, Florida 32306 (No charge, limited copies available)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Administrator Attitudes; Course Evaluation; *Curriculum Development; Decision Making; Educational Quality; Information Systems; Instructional Materials; *Material Development; *Needs Assessment; Performance Based Education; Postsecondary Education; Program Effectiveness; *Program Improvement; Secondary Education; *State Surveys; Statewide Planning; Teacher Attitudes; Technical Education; Vocational Directors; *Vocational Education; Vocational Education Teachers
IDENTIFIERS Florida; Instructional Materials Assessment Survey

ABSTRACT

This paper describes an information system designed for data-based decision making by a state vocational education agency in prioritizing courses for instructional materials development or acquisition. This needs assessment system is the second part of a project which focused attention on the need for competency-based instruction. The information system is described as follows. A survey instrument, administered statewide to teachers in selected vocational courses, is used to measure the quality of materials currently in use in terms of discrepancy-from-ideal (D). The importance (I) for each course of developing instructional materials is calculated as the weighted mean of several factors, such as number of students, placement statistics, job market prospects (demand), job earnings, cost category, and other factors. A priority index, the product of I times D, is used to rank order the courses. Appendixes in this document include the importance factor weighting instrument, a sample page from the instructional materials assessment survey (IMAS), an IMAS course/program information summary sheet, and a pair-comparison instrument. (Author/CSS)

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FLORIDA'S VOCATIONAL CURRICULUM SYSTEM: NEEDS ASSESSMENT AND PRIORITIZATION

Ora M. Kromhout

Florida State University

Presented at the Annual Meeting of the

American Educational Research Association

Toronto, Ontario

March, 1978

CE 017 806

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Florida's Vocational Curriculum System:

Needs Assessment and Prioritization

ORA M. KROMHOUT

Florida State University

ABSTRACT

This paper describes an information system designed for data-based decision making by a state vocational education agency, with respect to prioritization of courses for development of instructional materials.

A survey instrument, administered statewide to teachers in selected vocational courses, measures the quality of materials currently in use in terms of discrepancy-from-ideal (D).

The importance (I) for each course of developing instructional materials is calculated as the weighted mean of several factors, such as number of students, job demand, etc.

A priority index, the product of I times D, is used to rank order the courses.

FLORIDA'S VOCATIONAL CURRICULUM SYSTEM: NEEDS ASSESSMENT AND PRIORITIZATION

Ora M. Kromhout, Florida State University

This paper describes an information system designed for use by a state vocational education agency in prioritizing courses for instructional materials development or acquisition. Developed at the Florida State University Career Education Center, the model combines two major types of information for each course under consideration--the quality of materials currently in use in the course, and the importance of the course in terms of need for instructional materials.

The commitment of the Florida Division of Vocational Education to competency-based instruction (CBI) has focussed attention on the need for instructional materials that facilitate this type of instruction. The Division addressed this need with a two-part project. One part is a system for searching for appropriate materials, and adapting or developing when suitable materials cannot be found. This process can accomodate only a limited number of courses in the given year. Therefore an equally important part of the project is to prioritize courses so that those most in need can be considered first for development or acquisition of materials. This second part, the needs assessment system, is the subject of this paper.

Florida's vocational education programs are divided into seven major program areas: agri-business and natural resources, business, distributive, diversified occupations, health and public service occupations, home economics, and industrial. More than 500 courses are listed under these program

areas in the state's course code directory. A system was needed which would provide the agency with a rank-ordered list of courses across all program areas, the order indicating an overall need that includes not only the discrepancy from ideal of the materials currently used in the course, but that also includes such considerations as course enrollments and job market demand. These have been called importance factors. A model was developed which rank-orders the courses according to a priority index (P), which is calculated by multiplying the discrepancy from ideal (D) times importance (I).

The next section of this paper describes the application of the model to specific data, showing procedures followed and results obtained. Theoretical considerations involved in the development of the model are discussed in a later section.

Application of the Model

The three basic steps in applying the needs assessment model are (1) determining the importance (I) for each course; (2) determining the discrepancy (D) from ideal of the instructional materials concurrently in use in that course, and (3) calculating a priority index (P) for each course by multiplying I times D. This priority index is used to rank-order the courses.

The procedures for each of these steps are described in the following paragraphs. Sample data from the application of these procedures to courses during the past year are given, which should be helpful in clarifying the procedures used.

Determining Importance (I) For Each Course

Initial discussions with vocational education administrators about ways of prioritizing courses to be chosen for instructional materials development projects brought out the fact that the quality of currently used materials was not the only factor to consider. For example, if a survey of teachers in a certain course showed that the course had poor materials, but only five schools in the state offered that course, with a total of 100 students, it would not be a prime candidate for a project. Statewide enrollment, or some such measure of size, would influence the decision. Other important factors agreed upon were the number of job openings in the occupation, typical earnings of persons who complete the course, job placement record for course completers, and category of funding for the course. Additional factors were proposed, but were not used either because (a) reliable quantitative data were not readily available (e.g. student attitude), (b) the factor was highly correlated with an existing factor (e.g. number of teachers would provide a weighting very similar to student enrollment), or (c) the average weight assigned was insignificant compared with the major factors, and not worth assembling the data.

The model provides a way to take the agreed-upon factors into account, with different weights to reflect the different degree of importance attached to each. The weights were determined by 59 vocational education administrators at the state and regional level, who filled out an instrument (Appendix A) in which they distributed 100 points acorss the factors to indicate the relative importance of each factor. This process served several purposes. The respondents became familiar with the model since it had to eb explained to them before they filled out the instrument. The respondents had an opportunity to consider explicitly the

relative importance of the factors, and to discuss this in more concrete terms than usual with their colleagues. In addition, the state level decisions on choosing courses for development gained credibility with this network of educators since they had input into it. The model was well received by people in the field as a move toward data-based decision making that would more accurately meet actual needs.

Results of the weightings are shown in Table 1.

Data for each of the five factors was assembled, for each of the 111 courses suggested by the state program directors, from the data files of the Division's Management Planning and Information Services. Table 2 shows the raw data for a sample of 10 of the 111 courses actually covered in the importance calculations.

In summary, the steps involved in obtaining the importance (I) for the courses are:

1. Determine importance factor weights, as shown in Table 1.
2. Enter raw data for each factor, for each course (Table 2).
3. Normalize the data: For each factor (column) in the raw data, find the largest value in the column. Divide that number into each number in the column. The resulting normalized data has a maximum value of 1.00.
4. Calculate the importance (I) for each course (Table 2) by multiplying the normalized data for each factor by the factor's weight, then summing across factors.

   $I = (w_1\ a_1)+(w_2\ a_2)+(w_3\ a_3)+(w_4\ a_4)+(w_5\ a_5)$
5. Rank-order the courses in order of (I)

Table 1

Mean Importance Factor Weights Assigned by Vocational Educators (n=59)

Factor	Mean Number of Points Assigned	S.E. of Mean S.D./$\sqrt{n}$
Job market demand	33	1.7
Enrollment	24	1.6
Placement statistics	15	2.3
Job earnings	10	1.0
Cost category	8	1.1
Other	10	

Table 2

Importance Factors

		Raw data					Normalized data (w_1=33 w_2=24 w_3=15 w_4=10 w_5=8)					Importance (I)[y]	Rank by (I) (out of 111 courses)
		a_1 Job market demand	a_2 No. of students	a_3 Placement	a_4 Earnings	a_5 Cost category	a_1 Job market demand	a_2 No. of students	a_3 Placement	a_4 Earnings	a_5 Cost category		
4635	Market. & Merch.	15661	9726	47	119	2.18	1.00	.73	.47	.54	.51	67	1
9013	Air Cond. & Htg. Mech.	825	13300	54	174	2.64	.05	1.00	.54	.78	.62	47	5
7646	General Office Clerk	10000	2972	46	110	2.18	.64	.22	.46	.50	.51	42	6
3042	Nursing - RN, AD	4054	1033	100	118	2.64	.26	.08	1.00	.53	.62	36	9
3080	Respiratory Therapy Tech.	470	108	100	140	4.26	.03	.01	1.00	.63	1.00	31	19
2757	Food Prod. & Service	4003	1460	31	130	2.64	.26	.11	.31	.59	.62	26	29
3663	Landscape Install. & Maint.	3106	1612	32	125	2.64	.20	.12	.32	.56	.62	25	33
4766	Estab., Oper. New Bus.	380	1327	30	222	1.40	.02	.10	.30	1.00	.33	20	61
3671	Nat. Resources Conserv.	166	624	26	129	4.26	.01	.05	.26	.58	1.00	19	69
9793	Motorcycle Mechanics	400	623	28	175	2.18	.03	.05	.28	.79	.51	18	78

[x]Sample calculation of normalized data::
For "job market demand, the largest raw value in the column is 15661. Divide all figures in that column by 15661 to obtain column a_1 under "normalized data."

[y]Sample calculation of I for course 4635:

$I = w_1 a_1 + w_2 a_2 + w_3 a_3 + w_4 a_4 + w_5 a_5$

$= (33)(1.00) + (24)(.73) + (15)(.47) + (10)(.54) + (8)(.51)$

$= 33 + 18 + 7 + 5 + 4 = 67$. Figures have been rounded off for clarity.

A simple computer program can perform steps 3, 4, and 5. The time-consuming part of the operation is locating and tabulating the data.

Determining Discrepancy (D) From Ideal For Each Course

The second major part of the model is concerned with measuring the quality, for competency-based instruction, of the instructional materials currently in use in each course. This was done by surveying the course instructors, using the Instructional Materials Assessment Survey, a 65-item instrument which covers eight characteristics that are desirable in competency-based instructional materials--objectives, learning activities and criterion-referenced tests matched to the objective, complete and up-to-date content, provision for individualized instruction, validation, appropriateness for students actually in the course, and course management information. In addition, the survey provided information on the coverage of employability skills in the materials, and on the availability and quality of a list of objectives for the course.

The purpose of the Instructional Materials Assessment Survey (IMAS) is to determine the need for competency-based instructional materials in each course. The need is defined here as the discrepancy (D) between the materials actually in use and ideal, competency-based individualized materials.

The characteristics of "ideal" competency-based instructional materials were defined by questioning a group of 19 individuals who had experience in designing competency-based materials. Using a modified delphi approach, each of the "inputs" was informed as to the opinions of the others in two successive cycles.

Discrepancy is evaluated in terms of an average score, across all teachers in a given course, on the IMAS instrument. In responding to the items, the instructor answers strongly agree, mildly agree, mildly disagree, or strongly disagree, to a series of statements about desirable properties of instructional materials. (Appendix B shows a sample page from the survey

instrument.) These four choices are assigned scores of 4, 3, 2 and 1 respectively; "don't know" is treated as a blank. Therefore, the average score on the survey can range from 1.0, for the worst possible materials, to a perfect score of 4.0. The instructor is not evaluating any one set of materials in responding to these statements, but rather (s)he answers on the basis of the total package of materials used by students in the class.

The instrument was designed to be administered in a group setting by a trained survey leader. A survey leader's guide and a filmstrip/cassette were developed to standardize administration. The instrument and filmstrip underwent a series of 10 field tests, with revisions after each test to correct ambiguous or unclear wording. Approximately 200 survey leaders were trained by project staff to set up the teacher survey sessions, administer the survey, and send in the data. The purpose of these rather extensive preparations was (1) to maximize reliability of the results through standardized administration procedures and (2) to reach as many as possible of the teachers in the state who teach the courses selected for surveying.

The number of courses that can be surveyed each year is limited by the practical problem of getting teacher time to attend the survey sessions. It was decided that only 20 courses could be included in this first year of the survey, and that the best way to select the 20 courses from the 111 courses suggested by the state program directors was to choose the top 20 courses based on importance (I) rankings.

The twenty courses were surveyed between September 1977 and February 1978, with 600 instructors responding. They marked their responses on computer op-scan sheets. After each survey session, the survey leader mailed the completed computer sheets to the Career Education Center for scoring and analysis. A computer program was written to calculate, for

each course, subscores for each of the eight characteristics, as well as an overall mean score (M). The need, or discrepancy, (D) was then calculated as the difference between the course mean score and a perfect score (4.0 - M). These results are shown in Table 3.

It is interesting to note in Table 3 that the materials in most courses were weakest in the areas of course management information, criterion-referenced tests, and individualization.

The computer printout provided considerable information on each course besides that reported in Table 3. Particularly useful was information on the availability and quality of a set of objectives for each course. When the Division is considering the priority to assign to a course, it is helpful to know whether a good set of objectives exists. If not, a valid set of objectives would have to be found or developed before any review/select, or development of instructional materials could begin. Florida is a member of the Vocational-Technical Education Consortium of States (V-TECS), and for some of the courses surveyed, a V-TECS catalog of objectives is already in existence.

In addition, each course received an overall score for coverage of employability skills in its materials, as well as a subscore on each of the following topics: choosing an occupation, searching for a job, applying for a job, good work habits, personal finances, and job changes. As shown in Table 4 there are wide differences among the courses as far as employability skills coverage in their instructional materials. But in general, the materials showed rather low scores in this important area. Averaging across courses, work habits received the best score (2.3), while personal finances and job changes were poorest (1.8) on a scale of 1.0 to 4.0.

Table 3

Scores and Subscores on IMAS Survey, by Course

Course number	Course title	n	Objectives	Appropriateness	Content	Learning Activities	Individualization	Management	Tests	Validation	M Overall Mean Score	D Discrepancy (4.0-M)
4635	Markt. & Merch. Management 1	99	3.2	3.2	3.3	3.4	3.2	3.0	3.1	3.2	3.2	.8
9013	Air Cond. & Heat. Mechanics	34	2.6	3.1	3.2	2.9	2.4	2.0	2.5	2.6	2.6	1.4
3041	Nurse Aide	57	2.6	3.2	3.1	2.5	1.9	1.6	1.9	2.3	2.4	1.6
4611	Banking Fundamentals	11	2.3	2.8	2.9	2.5	2.3	2.1	2.1	2.5	2.5	1.5
3042	Nursing - RN, AD	78	3.1	3.4	3.2	2.9	2.2	1.6	2.5	2.5	2.7	1.3
9163	Carpentry	38	3.1	3.1	3.4	3.2	2.8	2.6	3.0	3.0	3.1	.9
8116	Criminal Justice Tech.	21	2.9	3.4	3.4	2.6	2.1	1.9	2.4	2.9	2.7	1.3
8028	Electronics Tech.	17	2.9	3.6	3.3	3.1	2.6	2.0	2.4	3.0	2.8	1.2
9553	Machine Shop	11	2.8	3.2	3.5	3.4	2.7	1.9	2.9	2.8	2.9	1.1
8115	Fire Science Tech.	5	2.8	3.0	3.1	3.0	2.4	2.3	2.5	2.6	2.7	1.3
4631	Cashiering for Sales People	12	3.0	2.7	3.0	3.0	2.7	2.3	2.6	2.9	2.8	1.2
9533	Metal Trades Cluster	2	3.4	3.5	3.9	3.8	2.4	2.6	2.3	3.8	3.2	.8
8100	Air Cond., Refrig. & Heat. Tech.	11	1.8	3.0	2.7	2.4	1.8	1.6	1.7	2.4	2.1	1.9
9323	Industrial Electronics	22	2.6	3.0	3.0	2.7	2.3	1.9	2.4	2.7	2.6	1.4
3080	Respiratory Therapy Tech.	15	3.1	3.1	3.4	3.1	2.3	1.5	2.7	2.9	2.8	1.2
9273	Industrial Electricity	13	2.7	2.9	3.1	2.9	2.4	2.1	2.5	2.7	2.7	1.3
7774	Word Processing	25	2.6	2.8	3.0	2.8	2.3	2.2	2.5	2.7	2.6	1.4
7648	Reprographics	17	2.6	3.2	2.8	2.9	2.1	2.0	2.4	2.4	2.5	1.5
9303	Electric Wiring	15	2.8	3.2	2.9	2.5	2.3	2.1	2.3	2.4	2.6	1.4
7616	Bookkeeper	98	2.6	3.3	3.2	3.1	2.4	2.2	2.2	2.4	2.7	1.3
Average		30.0	2.8	3.1	3.2	2.9	2.4	2.1	2.4	2.8	2.7	1.3

Table 4

Employability Skills Score For Instructional Materials

Course Number	Course Title	Choosing An Occupation	Job Search	Applying For A Job	Good Work Habits	Personal Finances	Job Changes	Overall Score
4635	Markt. & Merch. Management 1	3.1	3.2	3.4	3.3	2.8	2.8	3.0
9013	Air Cond. & Heat. Mechanics	1.8	1.8	1.8	2.1	1.5	1.5	1.7
3041	Nurse Aide	1.7	2.0	1.9	2.2	1.3	1.6	1.7
4611	Banking Fundamentals	2.3	2.0	2.3	2.4	2.2	2.2	2.2
3042	Nursing - RN, AD	2.1	2.2	2.2	2.4	1.2	2.0	1.9
9163	Carpentry	2.4	2.2	2.4	2.7	2.0	2.1	2.3
8116	Criminal Justice Tech.	2.0	1.8	1.8	2.3	1.5	1.4	1.8
8028	Electronics Tech.	1.8	1.6	1.8	2.2	1.4	1.6	1.7
9553	Machine Shop	2.1	2.1	1.7	2.4	1.6	1.6	2.0
8115	Fire Science Tech.	2.0	2.2	2.0	2.4	1.2	1.8	2.0
4631	Cashiering for Sales People	2.3	2.8	2.9	2.8	2.5	2.5	2.6
9533	Metal Trades Cluster	2.5	2.0	2.0	2.5	2.0	2.5	2.3
8100	Air Cond., Refrig. & Heat. Tech.	1.6	1.3	1.2	1.8	1.0	1.0	1.4
9323	Industrial Electronics	1.7	1.6	1.6	1.7	1.4	1.5	1.6
3080	Respiratory Therapy Tech.	1.8	1.9	1.8	2.2	1.1	1.6	1.8
9273	Industrial Electricity	1.6	1.8	1.8	2.2	1.3	1.7	1.9
7774	Word Processing	2.1	2.2	2.4	2.3	1.7	1.8	1.9
7648	Reprographics	1.8	1.9	2.0	2.2	1.6	1.9	1.8
9303	Electric Wiring	2.4	2.4	2.4	2.5	1.8	2.2	2.1
7616	Bookkeeper	1.6	1.5	1.7	1.8	1.7	1.4	1.6
	Average	2.0	2.0	2.0	2.3	1.8	1.8	2.0

Calculating the Priority Index (P)

The priority index (P) is readily obtained for each course by multiplying the importance (I) by the discrepancy or need (D), as shown in Table 5. In that table, the courses have been rank-ordered by the priority index (P) for competency-based instructional materials. The right-hand side of the table gives the same type of information about the need for a set of objectives, also based on information from the survey.

Table 5 is the major product of the application of the model. It provides the state level vocational educator with a few simple-to-use numerical ratings which represent a large amount of pertinent information in a comprehensible form. For example, a comparison of the two Distributive Education courses 4611 and 4635 shows that 4635 is more "important" than 4611, but 4635 is much less in need of materials. 4611, Banking Fundamentals, not only ranks high (third) in priority for instructional materials, but also ranks very high in need for a set of objectives.

In addition to this comparative data, project staff wrote up a summary sheet for each course (Appendix C). This sheet summarizes the IMAS data, shows how many abstracts about existing materials have turned up in a computer search by the Florida Educators' Information Service (FEIS), and interprets the information in terms of the implications for a possible project to develop or acquire materials.

The culmination of the process is the designation, by state vocational educators, of priority courses for projects to develop or acquire instructional materials.

Table 5

INSTRUCTIONAL MATERIALS ASSESSMENT SURVEY (IMAS) - COURSE RANKINGS BY OBJECTIVES AND INSTRUCTIONAL MATERIALS

		INSTRUCTIONAL MATERIALS				SET OF OBJECTIVES		
Course Title	Number	Importance (I)	Need (D_I) For Inst. Mats.	Priority Index (P=IxD)	IMAS Rank	Need ($D_\emptyset$) For Objectives	Importance x Need ($I \times D_O$)	IMAS Rank
Air Conditioning & Heating Mc.	9013	46.6	1.41	61.0	1	1.13	52.7	5
Nurse Aide	3041	38.9	1.56	60.7	2	1.18	45.9	7
Banking Fundamentals	4611	36.4	1.54	56.1	3	1.91	69.5	1
Air Cond., Refrig. & Heat. Tech.	8100	30.5	1.81	55.2	4	1.98	60.4	2
Marketing & Merchandising 1	4635	67.0	.79	52.9	5	.64	42.9	9
Nursing - RN, AD	3042	35.7	1.25	44.6	6	1.08	38.6	13
Industrial Electronics	9323	30.5	1.41	43.0	7	1.43	43.6	8
Reprographics	7648	30.0	1.42	42.6	8	1.86	55.8	3
Criminal Justice Technology	8116	34.4	1.23	42.3	9.5	1.08	37.2	14
Electric Wiring	9303	30.0	1.41	42.3	9.5	1.76	52.8	4
Word Processing	7774	30.0	1.36	40.8	11	1.08	32.4	15
Fire Science Technology	8115*	32.3	1.24	40.0	12	1.28	41.3	11
Industrial Electricity	9273	30.3	1.31	39.7	13	1.41	42.7	10
Cashiering for Sales People	4631	31.7	1.18	37.4	14	.85	26.9	17
Electronics Technology	8028	33.6	1.11	37.3	15	1.46	49.1	6
Bookkeeper	7616	29.7	1.23	36.5	16	1.36	40.4	12
Respiratory Therapy Tech.	3080	30.5	1.16	35.4	17	.57	17.4	18
Machine Shop	9553	32.5	1.04	33.8	18	.37	12.0	20
Carpentry	9163	34.8	.91	31.7	19	.80	27.8	16
Metal Trades Cluster	9533**	30.7	.73	22.4	20	.50	15.4	19
Average			1.25			1.19		

Theoretical Considerations

In the development of a model such as this, decisions must be made which involve issues such as those discussed in this section. While the procedures described in the preceding section can be followed without a reading of the following paragraphs, this explication of decisions inherent in the model may be useful to the reader interested in tailoring the model to fit his or her own situation.

Discrepancy Analysis

Throughout the model, the concept of need has been defined in terms of a difference or discrepancy from an ideal, desired state. Operationally, need was defined as the difference between the actual survey score for a course, averaged across all responding teachers for that course, and a perfect score of 4.0.

Target Population for the Survey

In principle, a questionnaire to assess quality of instructional materials now in use could have been directed to students, teachers, supervisors, regional consultants, or state program directors. The project staff selected the classroom instructor as the person who could give the most accurate information about the objectives, tests, learning activities, and other instructional characteristics of materials actually being used in the classroom.

The goal of the IMAS survey was to reach as many teachers as possible in the selected courses, rather than a sample. An alternative and theoretically better method would have been to select a random sample of adequate size from a statewide roster of teachers for each of the 20 courses, and push

for 100% response from the random sample. The logistics of doing this were judged to be impractical at the present time, although some type of sampling approach has not been ruled out for the future.

Multiplicative Model

The priority index (P) used for the final rank-ordering of the courses is the product of importance (I) multiplied by need or discrepancy (D). The resulting table (Table 5) is thus intended to be used as a rank-ordered priority list--one starts at the top, and works down.

Other approaches could be used instead. Two that were considered were (1) an additive model and (2) a decision-rule model. In an additive model, the importance and discrepancy could be added together, rather than multiplied. This would require some method of normalizing the data so that the large I numbers would not overwhelm the smaller D numbers. Another way to do this would be to assign ranks separately to I and to D, then add the ranks and divide by 2.

The decision-rule model would be based on the concept of giving priority only to those courses that have both high importance and high need. Obviously this requires agreement on the definition of 'high' in both cases, and makes it impossible, for instance, for a course of average importance to be chosen, even if its need is critical.

The multiplicative index (P=IxD) was chosen for this model as it reflects the fact that the loss of instructional benefits, due to a discrepancy-from-ideal of materials in a given course, will be proportional to the number of students using those materials, and to the other importance factors.

Multiplicative models have also been chosen for other needs assessment models. Dyer and Strickland (1971) presented a model which provides a school principal with index numbers. These index numbers represent estimates of expected changes in utility, for the performance of his or her school, which would result from the adoption of certain programs. A priority value was computed as the product of rated importance and the unscaled expected increase in utility.

Another multiplicative model, described by Witkin (1975), was developed by the Westinghouse Learning Corporation and the Measurement Research Center as the University of Iowa. The following relationship was used to arrive at priorities:

$$\text{Priority ranking of needs} = \frac{\text{Importance x Responsibility}}{\text{Attainment}}$$

Weighted Importance Factors

The importance (I) for a course is a weighted combination of five importance factors: job demand, enrollment, placement, earnings, and cost category. It is calculated according to the formula

$$I = \frac{\sum_{i=1}^{5} w_i a_i}{\sum_{i=1}^{5} w_i}$$

where the w_i are the relative weights of the five factors, and the a_i are the normalized measurements or values of that factor for the particular course. The w_i's are the same for all the courses, whereas the a_i's change from one course to another. The procedures for determining the weights w_i and the normalized values a_i are similar to the multi-attribute utility measurement technique described by Edwards, Guttentag, and Snapper (1975). These authors described a version "oriented toward easy communication and

use in enviornments in which time is short and decision makers are numerous and busy."

The method of weighting the importance factors differs in two ways from the Edwards, Guttentag and Snapper model. The instrument used for obtaining the weights (Appendix A) had respondents distribute 100 points across the factors, rather than having them assign a value of 10 to the lowest factor (dimension), and scale up from there. This eliminates the problem of locating a zero point, which is necessary for using the ratio properties of the weights. The other difference is the method of normalizing the a_i's (similiar to the u_{ij}'s in Edwards et al). In their model, a minimum and maximum plausible value was estimated, and used to re-scale the u_{ij}'s to a 0-100 scale. The a_i's, on the other hand, have a minimum value of zero, and no meaningful maximum. For the a_i's, the maximum value for comparing one course to others in a given set of courses was taken as the maximum value of a_i in the set; this was used for normalizing as shown at the bottom of Table 2.

The weights for the importance factors were obtained from analysis of the instruments (Appendix A) completed by 59 vocational education administrators at the state and regional level. Plans are now underway to add data from the vocational education directors of the 67 Florida counties, as well as the occupational deans of the state's community colleges and the directors of vocational-technical centers. As mentioned previously in this paper, there are several advantages to involving substantial numbers of the state's vocational education network in these ratings:

1. The respondents become familiar with the model, as it must be explained to them in order to have them complete the instrument.
2. State level decisions gain credibility with this network of educators since they had input into it, and they see it as a move toward

more objective, data-based decision-making that will more accurately meet actual needs.

3. The respondents and especially the state level decision-makers must consider explicitly the relative importance of the factors, and discuss this in more concrete terms than usual with their colleagues.

This last point deserves further development. Suppose, for example, three vocational educators--one each from the industrial, health, and distributive education areas--sat down together to prioritize courses. The industrial educator might argue the importance of the industrial courses, because of the large student enrollment. But the health educator might point to an outstanding placement record for health program completers, and say that's the crucial consideration. The distributive educator would probably point out to the other two the tremendous number of job openings in the distributive education field, surely a most important factor in prioritization. Each might rank-order the priority list very differently.

But if the process is backed off one step, and the same threesome is asked to distribute 100 points across five factors, discussing the issue with their colleagues, they would each admit that all the factors are important, and could live with a system that used factor weights based on an average of the respondents' ratings. This has, at least, been the experience in this project so far.

A study by Gardiner (1974) on this type of process has been reported in Edwards, et al (1975). When subjects, some with developer and some with conservationist viewpoints, rated permits for building near the California coastline, there was a significant difference in the ratings between the two groups. But when an 8-dimensional multi-attribute utility technique was used, disagreement was turned into modest agreement.

Weighting the Subscores of the IMAS Survey

The mean score reported in Table 3 for the instructional characteristics of the materials is actually a mean of a set of subscores which cover the eight instructional characteristics which are shown as column headings under subscores. Since these characteristics may not all be equally important for competency-based instructional materials, a study was done to determine the relative weights to assign to the subscores in computing the overall mean. A pair-comparision instrument (Appendix D) was developed and submitted to vocational instructors, vocational education administrators, and to Career Education Center staff involved in instructional design, evaluation, and dissemination of materials. The results are shown in Table 6. When these weights were applied to the subscores, and the resulting weighted mean score was compared with the unweighted mean score, the average difference between the weighted and unweighted mean was only 1%, approximately the size of the standard error of the mean. While this small difference is of negligible importance, Table 6 is interesting as a comparison of the three groups' ratings of importance of the different instructional characteristics. All three groups placed special importance on objectives and learning activities, and placed management information relatively low. Career Education Center personnel were much more concerned with tests and validation than were the other two groups, who were more interested in content.

Conclusions

The needs assessment model described in this paper has been applied during the past year to determine courses to be the subject of development/ acquisition projects in 1978-79. Work is underway to repeat the process during the remainder of 1978, to choose another set of courses to survey, carry

Table 6

Relative Weights for Instructional Characteristics of Materials.

by Rater Group

Instructional Characteristics	Vocational Instructors	Vocational Ed. Administrators	Career Education Center personnel	All respondents
	n = 52	n = 58	n = 19	n = 129
Objectives	1.14	1.39	1.33	1.28
Appropriateness	.83	.79	.98	.83
Content	1.18	1.17	.99	1.15
Learning Activities	1.26	1.19	1.25	1.23
Individualization	1.05	.87	.71	.92
Management Information	.78	.61	.35	.64
Tests	1.01	.94	1.14	1.00
Validation	.74	1.04	1.25	.95
Total[a]	8.00	8.00	8.00	8.00

[a]For ease of comparison, weights have been adjusted to total to eight, so that if all characteristics were weighted equally, each would have a value of 1.00.

out the survey, and present results to state administrators so they can, in early 1979, choose the courses for projects for 1979-80. To be sure, the system is not perfect, and will undergo changes as experience is gained. Some important factors may still be omitted, data in some cases is missing or questionable. But the information is still, in almost every case, far ahead of the information base formerly usable. Even the most well-informed state program leader, responsible for a program that covers as many as 100 courses, could not have in mind any information on all these factors for every course, let alone quantitative data, and a way of weighting them by their relative importance.

The model appears to be generally acceptable as a useful aid by state level decision makers.

It has also been well received by vocational educators in the state as a means of broader-based input into objective decisions. Their only concern is that the information be used, and not ignored.

An important question is whether to use the model as a decision-making or decision-assisting technique. The latter choice has the advantage of providing some flexibility for important considerations not included in the model, for example, courses that do not fit in well with the data base such as new and emerging occupations, and non-wage earning home economics. But caution should be exercised about departing too far from the results of the data, lest the integrity and credibility of the system be brought into doubt, and it will be seen as not worth the effort to implement it.

Appendix A - Importance Factor Weighting Instrument

Directions for filling out the form:

1. **READ** the list of weighting factors. While doing so, think about how important each factor should be in setting priorities on courses for development of instructional materials.
2. **ADD** additional factors to the list, if you wish. For example, you may add the number of teachers or number of schools in which the course is taught. If possible, suggest where the data for that factor might be found.
3. **DISTRIBUTE** 100 points among the factors, including any factors that you added. Points should be distributed to indicate the relative importance of the factors, in your opinion. For example, if you give 60 points to number of students, and 20 points to placement statistics, this means you think number of students should be three times as important as placement statistics in setting priorities for development of instructional materials. If a factor is of no importance to this decision, or is covered within another factor, give it a zero.
4. When you are finished, look over the weights you have assigned. Are you satisfied with the weight of each factor in comparison to all other factors? If not, make adjustments, keeping total number of points equal to 100.

FACTOR	WEIGHT (number of points)
Number of students	
Placement statistics	
Job marke prospects (demand)	
Job earnings	
Cost category	
Other (explain) _____	
Total	100

Appendix B - Sample Page From the Instructional Materials Assessment Survey (IMAS)

Part II—Objectives *in* Materials

All of the remaining items in this questionnaire deal with the characteristics of the instructional materials your students use.

Remember, it doesn't make any difference if your students use one set of instructional materials or several sets. The important thing is that you base your responses on all of the instructional materials that they use in the course you indicated in your I.D. number, including commercial materials, noncommercial materials, and locally produced materials.

Q 6 The instructional materials my students use contain objectives.

☐ a. strongly agree ☐ b. mildly agree ☐ c. mildly disagree ☐ d. strongly disagree ☐ e. don't know

Directions: If you checked **d** or **e** in answer to Q 6, you are finished with this section of the questionnaire. If you did not, please continue.

Objectives are stated behaviorally if they say what the student has to do, under what conditions, and how well.

Q 7 The objectives contained in the instructional materials used by students are stated behaviorally.

☐ a. strongly agree ☐ b. mildly agree ☐ c. mildly disagree ☐ d. strongly disagree ☐ e. don't know

Q 8 The objectives contained in the instructional materials that my students use are displayed so that students can easily see them.

☐ a. strongly agree ☐ b. mildly agree ☐ c. mildly disagree ☐ d. strongly disagree ☐ e. don't know

Q 9 The objectives contained in the instructional materials are up-to-date; that is, they closely match what a worker actually has to do on the job.

☐ a. strongly agree ☐ b. mildly agree ☐ c. mildly disagree ☐ d. strongly disagree ☐ e. don't know

Instructional materials may contain knowledge, skill, and/or attitude objectives.

A knowledge objective states what a student has to know, such as vocabulary, concepts, and rules.

Q 10 The instructional materials that my students use have *written knowledge objectives* that a student has to accomplish to successfully complete the materials.

☐ a. strongly agree ☐ b. mildly agree ☐ c. mildly disagree ☐ d. strongly disagree ☐ e. don't know

continue to next page

IMAS Course/Program Information Summary Sheet

1.0 Title Course Code # 4611 Banking Fundamentals

1.1 Teachers responding to IMAS: H.S. 4 Vo-Tec 3 C.C. 3 Total 11
no response 1

2.0 Objectives

2.1 Overall IMAS score for objectives: 1.0 = lowest 4.0 = highest (desired) 2.1

2.2 % of teachers with objectives: yes 55 % no 46 %

2.3 Teachers opinion of quality of objectives: 1.0 = lowest quality 4.0 = highest quality 2.8

2.4 FEIS search indicates the following number of references to existing objectives (not evaluated by expert opinion): 7

2.5 V-TECS catalog in same or related field: yes x no
Title of catalog and approximate availability date
"Banking Clerk"; Louisianna; complete by February, 1979

2.6 List any information about existing objectives you would like to stress (give title and source; use back for additional space):

3.0 Instructional Materials

3.1 Overall IMAS score for materials: 1.0 = lowest 4.0 = highest (desired) 2.5

3.2 Areas where IMAS indicates improvement needed All

3.3 FEIS search indicates the following number of references to existing instructional materials (not evaluated by expert opinion) 5

3.4 List any information about existing instructional materials you would like to stress

4.0 IMAS/FEIS Observations

Scored low in all areas, also in employability skills. Almost half have no objectives, and existing objectives were rated low in quality.

Greater need for objectives and instructional materials than either Cashiering (4631) or Merchandising (4635); need objectives first.

Appendix D - Pair - Comparison Instrument

Below are listed statements that describe **characteristics that are desirable** in instructional materials **for competency-based education.**

Characteristics

B There are **objectives written directly into the materials,** and the objectives provide clear statements of the required performances.

T The materials contain a system for evaluating students' performances, including **tests** and/or performance checklists that directly measure mastery of the objectives.

V The materials have been field-tested or in some way **validated** so that it is known that the instruction is effective.

C The **content** covered in the materials includes all the necessary knowledges, skills, and attitudes.

P The materials were designed to fit the characteristics and needs of the types of students who will be using them (the student **population**).

L The materials provide or specify appropriate student **learning activities,** practice, and reinforcement for mastery.

I The materials are structured well enough and provide enough student directions to allow open-entry/open-exit, self-pacing, and **individualization.**

M The materials are accompanied by adequate instructor **management** information, such as record keeping forms, course sequencing, and directions for implementation.

Directions: For each pair of characteristics listed below, circle the letter that represents the characteristic that is more important in competency-based instructional materials. Circle **one** letter in **each** pair. Answer on the basis of your own opinions as an educator.

C — I	B — T	C — T	V — C
T — V	I — B	V — B	T — P
P — V	L — M	L — I	B — C
I — T	L — T	P — M	I — M
B — P	I — P	L — B	V — L
T — M	M — V	V — I	B — M
M — C	L — P	C — P	L — C

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